



TTO Overview for the InSPIRE Industry Day

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**Weapons Systems
Platforms
Space Systems**



What makes DARPA unique...



Formed in 1958 to PREVENT and CREATE strategic surprise

Capabilities, mission focused

Finite duration projects

Diverse performers

Multi-disciplinary approach...from
basic research to system

engineering
As the DoD's innovation engine, we
are committed to the boldest, creative leaps...





Engaging with DARPA...



DSO

Physical Sciences
Materials
Mathematics
Training & Human Effectiveness
Biological Warfare Defense
Biology

MTO

Basic Science Core
Devices
Integration
Power
Architectures
Application

IPTO

Cognitive Systems
Command & Control
High Priority Computing
Language Processing
Sensors & Processing
Emerging Technologies

TTO

Advanced Weapon Systems
Advanced Platforms
Advanced Space Systems

STO

Comms, Networks & Cyber
Global Tactical ISR
Energy
Hybrid Warfare
Extreme Environments

TCTO

Complex Networks
Cyber-resilience
Engineered Biological Technologies
Intelligent Collaborative Systems
High-Performance Computing

AEO

Agile Programs with Frequent Development Cycles
Conduct Systematic Rigorous Assessments
Explore New Contracting Approaches
Develop strong Relationships

If you have an idea that is high-risk, high-reward and would like to do business with DARPA, please contact the appropriate Office Director or Program Manager.

www.darpa.mil



The Tactical Technology Office engages in high-risk, high-payoff advanced technology development of military systems, emphasizing the "system" and "subsystem" approach

- **Create highly capable systems that enable "order of magnitude" improvements in military capabilities**
- **Develop, demonstrate, and transition advanced technologies and concepts for effective, survivable, and affordable military systems**
- **Institute modern materials, design, and manufacturing techniques that enable low-cost production of world class military systems**

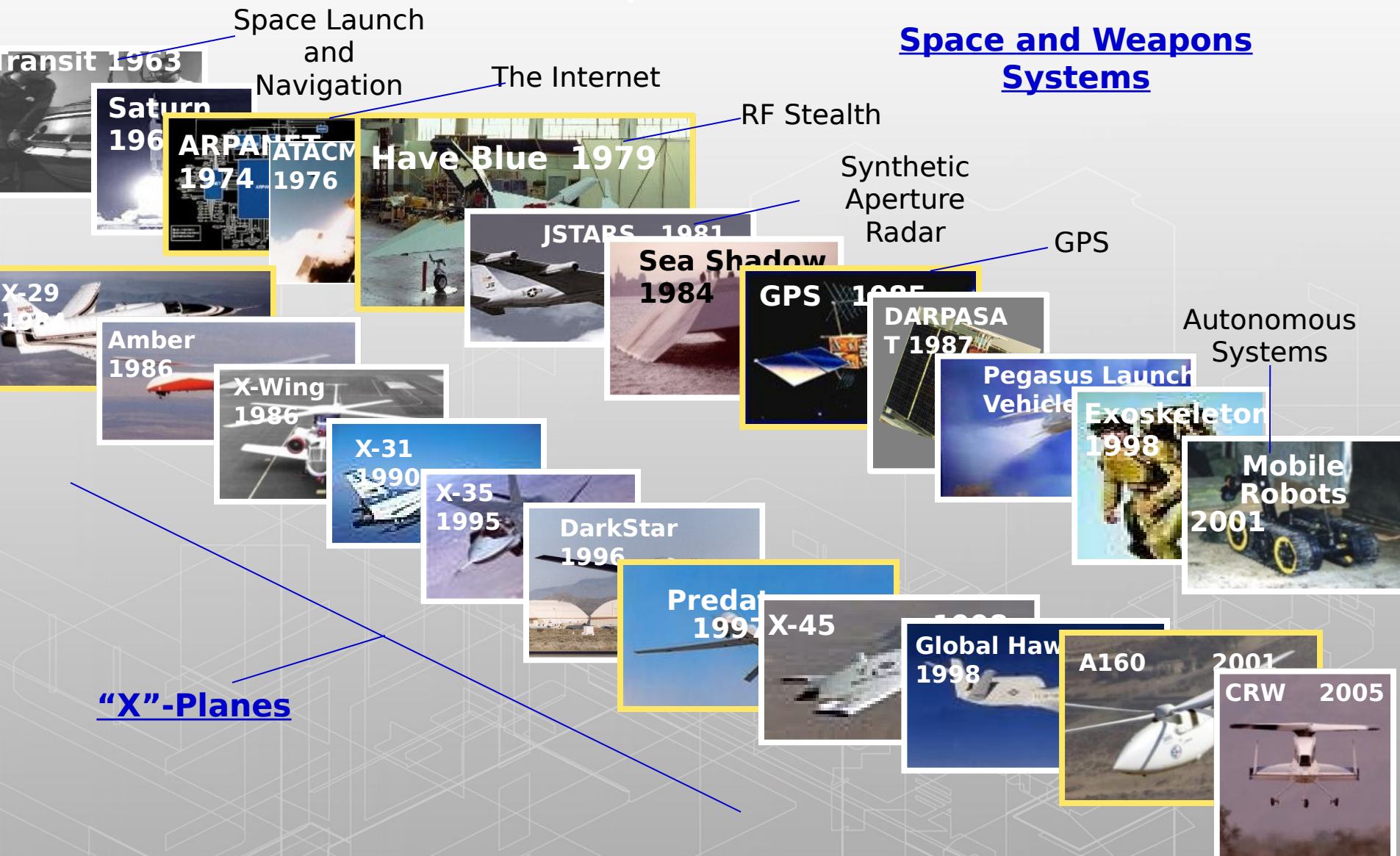
A typical DARPA TTO effort is a 3-5 year program to develop a prototype(s) showing proven technical capability



Unclassified DARPA Accomplishments



Space and Weapons Systems



Advanced Weapons Systems



Transforming the future of warfighting by pursuing high-risk, high payoff tactical technology and development of rapid, mobile, and responsive combat capability for advanced weapons, platforms and space systems.

Advanced Weapons Systems

- Weapons Delivery
- Precision Effects
- Kinetic / Non-Kinetic Effects



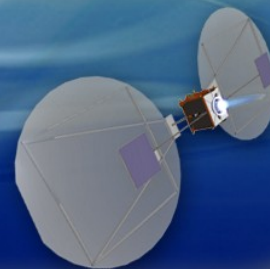
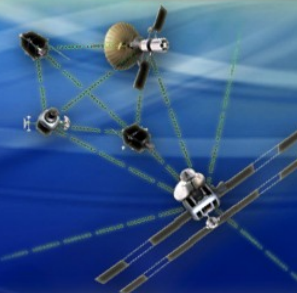
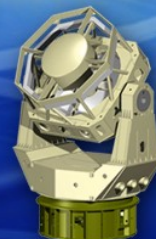
Advanced Platforms

- Unmanned Systems
- X-Planes
- Manned Platforms



Advanced Space Systems

- Ground Based Space Situational Awareness
- Advanced Space Technologies
- Rapid Access to Space



Advanced Weapons Systems Sub-thrust Areas

Weapons Delivery

- **Objectives:** Rapid responsive weapons delivery, reduced logistics footprint, and an engagement capability enabling employment of complex tactics against multiple targets across multiple domains
- **Military Utility:** Effective employment through weapon system responsiveness, availability, logistics supportability in the battlefield, cooperative engagement, and flexibility to respond to a spectrum of threats

Advanced Weapons Systems Programs by Sub-thrust area		
Program	Sub-thrust	Status
HTV-2	Weapon delivery	active
LRASM	Weapon delivery	active
HyFly	Precision effects	active

Precision Effects

- **Objectives:** Advanced concepts, methods, and techniques that improve weapon system target detection, discrimination, identification, location, tracking, attack and assessment of targets
- **Military Utility:** Rapid global engagement against high-payoff, time-sensitive-targets, with minimal collateral damage

Kinetic/Non-Kinetic Effects

- **Objectives:** Enhance precision engagement with advance munitions technology electromagnetics, plasma, atmospherics, acoustics, intelligent projectiles, and variable yield capabilities; Significant reductions in size, power consumption, and weight
- **Military Utility:** Enabler with adjustable, adaptable, lethal and non-lethal capabilities for scaled engagement against



Long Range Anti-Ship Missile (LRASM)

Mr. Rob
McHenry

Program Objectives

- Current anti-ship missiles are dependent on vulnerable supporting ISR, precision targeting, network data links, and GPS systems, and lack the survivability to penetrate maritime integrated air defenses
- LRASM de-risks those dependencies by demonstrating a weapon system that organically executes precision anti-ship engagements

Technical Approach

- Two diverse LRASM approaches will be demonstrated through high fidelity end-to-end flight tests
- Range sufficient to support effective engagement from well outside direct counter-fire ranges
- Design maturity for rapid Navy transition

Military Utility

LRASM prototypes will be at an operationally representative level of maturity to support rapid transition without system redesign



Placing a Leap Ahead Anti-Ship Weapon into the Hands of the Navy

Advanced Platforms Sub-thrust Areas

Unmanned

- **Objectives:** Improve navigation in dynamic conditions; Extend range and endurance; Increase adaptive autonomous operations
- **Military Utility:** Replaces soldiers in dirty, dull, and dangerous missions; Reduces weight and equipment burdens; Provides intelligence, surveillance and reconnaissance (ISR) standoff and combat engagement capability against critical targets; Reduces human resources required for high-risk missions

Advanced Platforms Programs by Sub-thrust area		
Program	Sub-thrust	Status
Big Dog	Unmanned	non-active
LS3	Unmanned	active
A160	Unmanned	active
Shrike	Unmanned	active

X-planes

- **Objectives:** Optimized designs for multiple missions and operating conditions; Advance innovative systems and concepts for aircraft, aircraft subsystems, propulsion, avionics and flight control technologies
- **Military Utility:** Enables rapid response globally; Quickly put focused technology into the battlefield; Technologies that support novel CONOPS and game changing tactics



Manned

- **Objectives:** Increase mobility, responsiveness, survivability, reliability, and supportability; Enhance efficiency and effectiveness of manned land, air, and sea platforms
- **Military Utility:** Rapid distribution of US forces to battlefield; Improve in-theatre transport and logistics;



Program Objectives

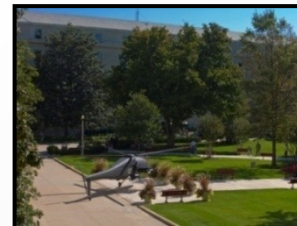
- **Achieve long fixed-wing like endurances with vertical take-off and landing (VTOL) capability**
- **Demonstrate a highly efficient, autonomous helicopter**
- **Platform enabling high endurance/altitude airborne surveillance-targeting capability against ground targets**

Technical Approach

- **Prototype air vehicle designed to achieve proof of principle**
- **Demonstrated platform performance goals**
 - **Total flight: 169.6 hours**
 - **Highest altitude: 19,433 ft MSL**
- **Established multiple records**
 - **FAI endurance record: 18.7 hours (300 lb payload)**
 - **Unofficial record for all rotorcraft**

Military Utility

- **Very long endurance, medium altitude, intelligence, surveillance and reconnaissance (ISR) capability & helicopter military utility**



Pentagon Display,
Oct 1, 2008



Phase I-Bridge Completion
Summer 2009



Forester Antenna Flight,
Aug 1, 2008



Stub Wing/Dummy Hellfire
Carriage/EO/IR Sensor,
Flights Jan, 2009



Payload Carriage, Sep 26,
2008



Advanced Space Systems



Transforming the future of warfighting by pursuing high-risk, high payoff tactical technology and development of rapid, mobile, and responsive combat capability for advanced weapons, platforms and space systems.

Advanced Weapons Systems

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- Precision Effects
- Kinetic / Non-Kinetic Effects



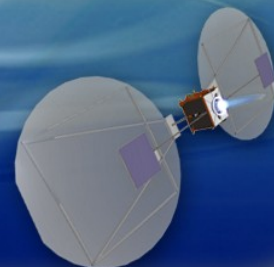
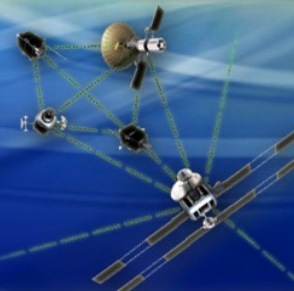
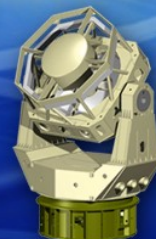
Advanced Platforms

- Unmanned Systems
- X-Planes
- Manned Platforms



Advanced Space Systems

- Ground Based Space Situational Awareness
- Advanced Space Technologies
- Rapid Access to Space



Advanced Space Systems Sub-thrust Areas

Ground Based Space Situational Awareness (GBSSA)

- **Objectives:** Identify novel technologies which will provide advanced and affordable GBSSA capability
- **Military Utility:** Complete search of high-altitude orbit and deep space with rapid updates; Unambiguously locate, identify, and characterize potential threats; Discriminate objects in close proximity; Detection of un-cued faint objects

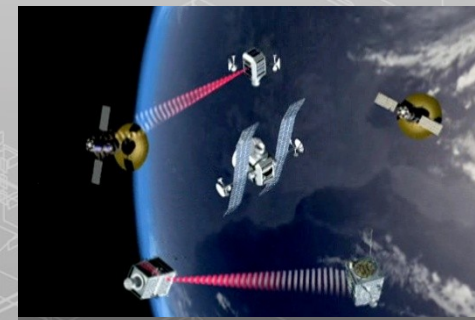
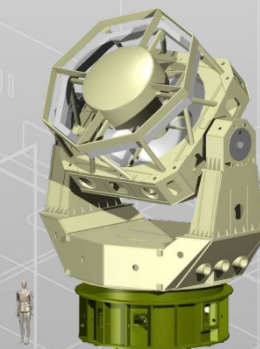
Advanced Space Technologies

- **Objectives:** Promote innovative power generation, energy management and propulsion; Scalable fractionated space systems; Modular sensors and common architectures adaptable to multiple vehicles and structures
- **Military Utility:** Expand useful space operations by developing technologies and mitigation strategies that protect critical space assets; Increased SSA; System lifecycle cost risk reduction; Capability for incremental system development

Rapid Access to Space

- **Objectives:** Reduce launch costs; Smaller and more capable systems; Ultra light weight extreme performance vehicles and structures; Highly efficient on-orbit maneuver and transfers
- **Military Utility:** Extreme maneuverability and power

Advanced Space Systems Programs by Sub-thrust area		
Program	Sub-thrust	Status
SST	GBSSA	active
System F6	Advanced Space Technologies	active
Catcher's Mitt	Advanced Space Technologies	new start



Mr. Paul
Eremenko

Program Objectives

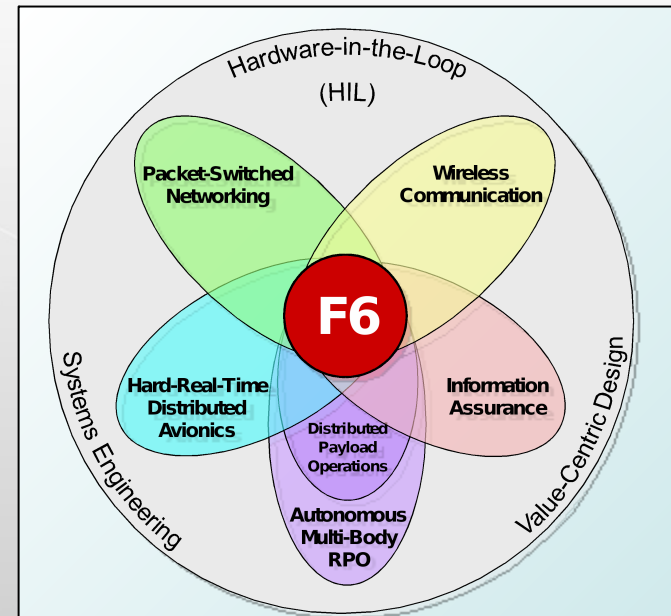
- Replace today's large, exquisite, inflexible systems with distributed architectures that are adaptable, responsive, and inherently survivable
- Develop and demonstrate a radical new space system architecture in which a monolithic spacecraft is replaced by a cluster of heterogeneous, free-flying modules

Technical Approach

- Fractionate spacecraft into 4+ heterogeneous modules
 - Autonomous multi-body proximity operations/cluster flight
 - Distributed, real-time spacecraft avionics functionality
 - Metrics of success:
 - Demo stationkeeping, coordinated maneuvering, collision avoidance behaviors, rapid defensive scatter
 - Demo first packet-switched space-to-space network, multiple levels of security, first space-based Inmarsat transceiver
- Phase II, detailed design and component test, contract was awarded November 2009

Military Utility

- Revolutionary step-change in adaptability and survivability
- Incremental system development, de-coupled payloads



Fractionated spacecraft

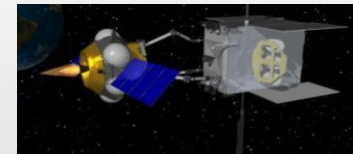
Technology Thrust Areas



Advanced Weapons



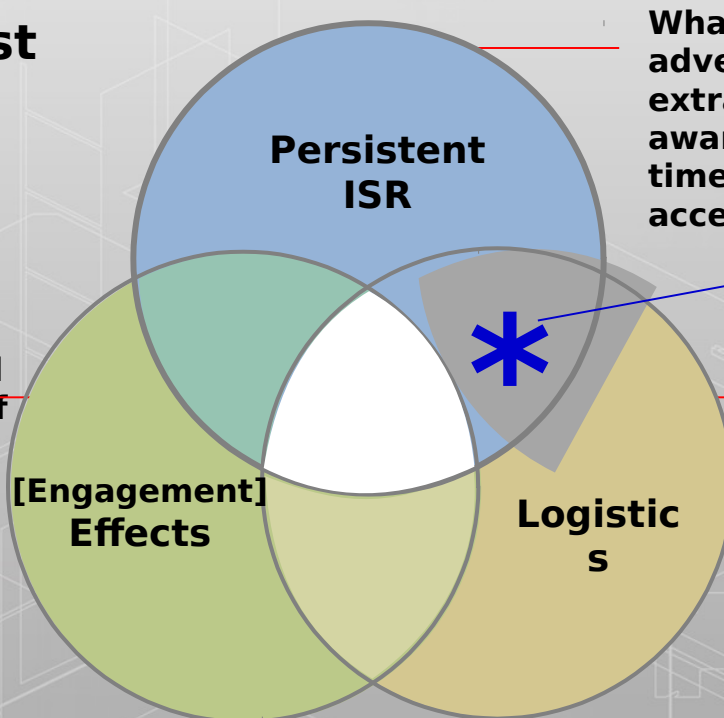
Advanced Platforms



Advanced Space Systems

Capability Thrust Areas

How do we prosecute time sensitive targets and decisively respond across the full range of armed conflict to engage challenges at global distances, while remaining survivable across all spectrums?



What technologies will remove adversary sanctuary and enable us extraordinary battlespace awareness in all domains to provide timely situation awareness in an access denied environment?

How do we rapidly project and sustain combat and stability capability worldwide in a wide variety of environments while reducing the end-to-end logistics burden and increase the versatility, agility, and efficiency of military operations?

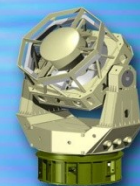
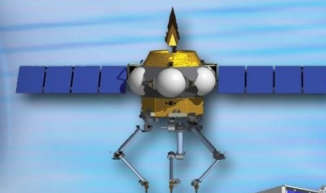
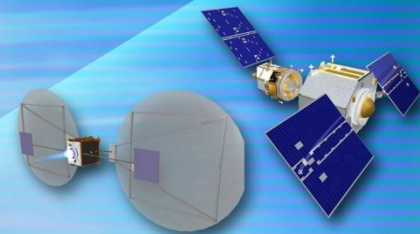


Doing Business with DARPA...



- ☐ Become familiar with the challenges and opportunities of National Security.
- ☐ Put your ideas in writing. Draft a white paper.
- ☐ Approach a program manager; they are the key to working with DARPA.
- ☐ Look for Requests for Proposals (RFPs) and Broad Agency Announcement (BAAs) solicitations at www.darpa.mil, www.darpa.mil/sbir, or www.fedbizopps.gov.
- ☐ Think boldly. Embrace risk.

Check the new TTO BAA, DARPA-BAA-10-09,
DARPA-BAA-10-09@darpa.mil.



**Weapons Systems
Platforms
Space Systems**